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Title:

Fringe Benefits: The hidden utility of movement constraints in telemetry studies

Abstract:

Advances in animal telemetry data collection techniques has been a catalyst for the
creation of statistical methodology for analyzing animal movement data. Such data and
methodology has provided a wealth of information about animal space use and the
investigation of animal-animal and animal-environment relationships. While the technology
for data collection is improving dramatically over time, we are left with massive archives
of animal telemetry data that are fraught with issues. One common issue pertains to
measurement error, that is, in the telemetry setting uncertainty pertaining to an
individual's true location. This form of error arises as a combination of factors due to
accuracy of the telemetry device and system, animal behavior, atmospheric interference,
and landscape features. Furthermore, the measurement error varies with both location and
time and the information available about the accuracy is not easily incorporated into
statistical models and is often in flux due to ongoing manufacturer findings. Thus, there
is a need for 1.) approaches to better estimate the telemetry error distribution and 2.)
improved methods to incorporate it into animal movement models. Using both simulations
and real data, we describe how certain forms of auxiliary information (hard constraints to
movement) can be surprisingly useful for learning about telemetry error which can then
incorporated into statistical models for animal space use.